REMARKS

Claims 1, 3, 4, 6, 7, 9 and 11-18 are pending. Claims 1, 3, 4, 6, 7, 9 and 11-18 stand rejected. Claims 1, 4, 7, 9, 11, 15 and 17 have been amended. In view of the remarks below, Applicants respectfully request that the rejections be withdrawn and the claims be allowed.

Claims 1, 3, 4, 6, 7 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0026540 to Smyers ("Smyers") in view of U.S. Patent No. 7,251,747 to Bean et al. ("Bean"). The rejection is respectfully traversed.

Claim 1 relates to a "method for processing a host command in a storage system including a plurality of storage elements coupled to a plurality of storage controllers." The method includes "receiving a host command directed to a volume of said storage system from a host," the host command received "at a first one of said plurality of storage controllers." The first one of said plurality of storage controllers stores "the host command until the host command has been executed to completion and the execution of the host command has been reported to the host." A target storage controller is determined for the host command, and, "if said target storage controller is not said first one of said plurality of storage controllers, forwarding the host command to said target storage controller." The target storage controller executes the command to completion and then forwards "to said first one of said plurality of storage controllers ... an execution status indicating completion of said host command." The first one of said plurality of storage controllers receives "said execution status" and forwards "said execution status to said host." As explained below, Smyers fails to disclose each element and limitation of claim 1.

Smyers discloses a controller 80 that "receives an instruction to record an audio/video stream of data" from a source device. Smyers, ¶ [0031]. The controller can also be a device within the network, such as a computer 20 or settop box 26. Smyers, ¶ [0029]. The controller 80 selects an audio/video hard disk drive (AVHDD) "to begin recording the stream of data coming from the source device." Smyers, ¶ [0032]. The selected AVHDD "determines which one of the available AVHDDs within the network should record the next stream of data." Smyers, ¶ [0033]. The selected AVHDD then forwards the record command to the recording AVHDD. *Id.* "If the

recording AVHDD runs out of available storage space while the source device is still transmitting the stream of data, the recordingAVHDD, will locate the next available AVHDD within the network and forward the record command to that AVHDD." *Id.* "Once the next available AVHDD begins recording the stream of data, it ... inform[s] the prior recording AVHDD that it is successfully recording the stream of data." Smyers, ¶ [0035].

The Examiner states that the selected AVHDD corresponds to the first one of said plurality of storage controllers recited in claim 1. Office Action, p. 3. If this is true, the selected AVHDD must be able to do at least the following: 1) receive a host command directed to a volume of said storage system from a host; 2) store the host command until the host command has been executed to completion and the execution of the host command has been reported to the host; 3) determine a target storage element of said storage system corresponding to said volume; 4) after said host command has been executed to completion by the target storage controller, receive an execution status indicating the completion of said host command; and 5) forward said execution status to said host. Additionally, the Examiner states that the recording AVHDD corresponds to the target storage controller. *Id.* If this is true, the recording AVHDD must be able to do at least the following: 1) forward an execution status to the selected AVHDD indicating the completion of said host command after said host command has been executed to completion by the recording AVHDD. These actions are not performed by either the selected AVHDD or the recording AVHDD, as explained below.

The selected AVHDD does not receive a host command directed to a volume of said storage system from a host. The selected AVHDD receives recording commands from the controller 80 (or alternatively, the computer 20 or settop box 26). Smyers, ¶¶ [0029], [0032], [0033]. Also, the received recording commands do not appear to be directed to any specific volumes. Instead, the selected AVHDD "determines which one of the available AVHDDs within the network should record the next stream of data. This determination is based on the available capacity of eac of the available AVHDDs and the current responsibilities of those AVHDDs." Smyers, ¶ [0033].

The selected AVHDD does not store the host command until the host command has been executed to completion and the execution of the host command has been reported to the host. As admitted in the Office Action, Smyers does not indicate that the selected AVHDD stores the host command until the host command has been executed to completion and the execution of the host command has been reported to the host. Office Action, p. 5; Advisory Action, p. 2. Smyers also does not disclose that the execution of the host command is reported to the host. Nowhere is this disclosed in Smyers. The Examiner suggests that it is inherent that computer 20 of Smyers receives a recording status. Office Action, p. 5. However, there is nothing in Smyers to suggest that the computer 20 has received an indication that the host command has been executed to completion.

The selected AVHDD does not determine a target storage element of said storage system corresponding to said volume. As explained above, the selected AVHDD determines a target storage element based on available capacity and current responsibilities, not based on a volume indicated in the host command.

The selected AVHDD does not receive an execution status indicating the completion of said host command after said host command has been executed to completion by the target storage controller. Smyers discloses the forwarding of a recording status from a recording AVHDD to a prior recording AVHDD. "Once the next available AVHDD begins recording the stream of data, it ... inform[s] the prior recording AVHDD that it is successfully recording the stream of data." Smyers, ¶ [0035]. This forwarded recording status indicates that the received command is executing successfully, not that the received command has executed to completion. The recording status is forwarded to the prior recording AVHDD even if an additional AVHDD is required to continue the recording of the data stream. Smyers, ¶¶ [0033], [0035]. Therefore, if the recording status is forwarded before the data stream has completed recording, it is impossible for the recording status to indicate that the host command has been executed to completion. Furthermore, the recording status described by Smyers is sent from one recording AVHDD to a prior recording AVHDD, not from a recording AVHDD to the selected AVHDD.

The selected AVHDD does not forward said execution status to said host. Smyers does not indicate which device, if any, sends an execution status to a host indicating completion of the host command. Conceivably, either the Smyers controller or one of the AVHDDs could send an execution status, if it is sent at all. The Examiner suggests that it is inherent that computer 20 of Smyers receives a recording status. Office Action, p. 5. However, there is nothing in Smyers to suggest that the selected AVHDD sends to computer 20 an indication that the host command has been executed to completion.

The recording AVHDD does not forward an execution status to the selected AVHDD indicating the completion of said host command after said host command has been executed to completion by recording AVHDD. As explained above, the recording AVHDD only sends s signal indicating that it is successfully executing the forwarded command, not that the command has been executed to completion. The signal sent by the recording AVHDD is sent to a prior recording AVHDD, not to the selected AVHDD.

For at least these reasons, Smyers fails to teach or suggest each of the elements and limitations of claim 1.

Bean is directed to a method for "efficient and accurate re-starting of data transfers using volatile data transfer mechanisms, such as pipes, following an error." Bean, Abstract. In Bean, a "fallback file" is used to save portions of transferred data. *Id.* The fallback file is overwritten or erased when the Bean module determines that a portion of the transferred data has been transferred correctly or that the transfer is complete. Bean, Abstract; col. 16, ll. 5-22. However, Bean fails to teach "storing the host command until the host command has been executed to completion and the execution of the host command has been reported to the host," as recited in claim 1. At most, Bean teaches the temporary storage of transferred data in a back-up file, wherein the data being stored is data transferred in response to a command. However, claim 1 recites that the host command is stored, not the data transferred in response to the host command. Bean does not teach this. Furthermore, Bean fails to remedy any of the inadequacies of Smyers discussed above.

For at least these reasons, the combination of Smyers and Bean fails to render claim 1 unpatentable, and claim 1 is allowable over the cited combination. Claim 3, which depends from claim 1, is also allowable over the cited combination for at least the same reasons that claim 1 is allowable.

Claim 4 also relates to a "method for processing a host command in a storage system including a plurality of storage elements coupled to a plurality of storage controllers." In claim 4, "a first one of said plurality of storage controllers" receives a host command. The first one of said plurality of storage controllers stores "the host command until the host command has been executed to completion and the execution of the host command has been reported to the host." and determines "a plurality of target storage controllers" to send component commands to, "the component command for a particular one of said plurality of storage controllers corresponding to at least a portion of the host command and relating to the logical volume associated with the particular target controller." Once each target storage controller executes to completion its component command, the at least first one of said plurality of storage controllers receives an "execution status from each one of said plurality of target storage controllers," the received execution statuses "indicating completion of said component command." The first one of said plurality of storage controllers determines "an aggregate host command execution status from said received execution status" and forwards "said aggregate host command execution status to said host." The stored host command is erased by the first one of said plurality of storage controllers. The combination of Smyers and Bean fail to disclose each of these elements and limitations.

For at least the same reasons described above in relation to claim 1, the combination of Smyers and Bean fails to teach or suggest a first one of said plurality of storage controllers that 1) receives a host command directed to a virtual volume of said storage system from a host; 2) stores the host command until the host command has been executed to completion and the execution of the host command has been reported to the host; 3) determines a plurality of logical volumes of said storage system corresponding to said virtual volume; 4) sends a component command to each of said plurality of target storage controllers, each component command corresponding to at least a portion of the host command and relating to the logical volume associated with the particular target

controller; 5) receives an execution status from each one of said plurality of target storage controllers; and 6) forwards an aggregate host command status to said host. Additionally, the cited combination does not teach or suggest that at each of said plurality of target storage controllers, the forwarding to the first one of said plurality of storage controllers of an execution status indicating the completion of said component command after said component command has been executed to completion by the target storage controller.

For at least these reasons, the combination of Smyers and Bean fail to render claim 4 unpatentable, and claim 4 is allowable over the cited combination. Claim 6, which depends from claim 4, is also allowable for at least the same reasons that claim 4 is allowable.

Claims 7 and 9 both relate to a storage system that includes a plurality of storage controllers. The "plurality of storage controllers further comprise means for processing a host command received from a host on any host port targeted to" any one or more of a "plurality of storage elements, the host command being received and stored by a single storage controller of the plurality of storage controllers and an execution status indicating completion of the host command being reported to a host by the single storage controller after the host command has been executed to completion even when the host command is executed by others of the plurality of storage controllers." Neither Smyers nor Bean disclose each of these elements and limitations of claims 7 and 9.

As explained above, the cited combination does not disclose a single controller that receives and stores a host command from a host and then reports to the host an execution status indicating that the host command has been executed to completion. The cited combination fails to disclose which, if any, device reports an execution status to the host. The cited combination fails to disclose an execution status that indicates completion of the host command. And the cited combination does not disclose the storing of a host command on a controller "even when the host command is executed by others of the plurality of storage controllers." For at least these reasons, the cited combination fails to render claims 7 and 9 unpatentable.

Thus, because the cited combination fails to teach each element and limitation of claims 1, 3, 4, 6, 7 and 9, these claims are allowable over the combination of Smyers and Bean. Applicants respectfully request the rejection be withdrawn and the claims be allowed.

Claims 11-16 stand rejected under 35 U.S.C. § 103(a) as being obvious over Smyers in view of U.S. Patent Application Publication No. 2001/0002480 to Dekoning et al. ("Dekoning") and further in view of Bean. The rejection is respectfully traversed.

Claims 11 and 15 relate to scalable storage controllers that include a plurality of modules. Each module includes a processing element. Claim 11 recites that "the processing element of each of said modules is configured to search mappings between storage volumes and storage devices and to receive and store a host command received from a host and report the execution status of the host command to the host after the host command has been executed to completion even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command." Claim 15 recites that "the processing element of each of said modules is configured to process a host command received from a host for accessing a virtual volume by causing each module associated with said virtual volume to access its respective storage device, to search mappings between virtual volumes and logical volumes and to store the host command and report the execution status of the host command to the host after the host command has been executed to completion even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command." Neither Smyers, Dekoning, nor Bean, either individually or combined, teach or suggest at least these elements and limitations of claims 11 and 15.

As discussed above, neither Smyers nor Bean teach or suggest a module with a processing element configured "to receive and store a host command received from a host and report the execution status of the host command to the host after the host command has been executed to completion even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command." Additionally, as admitted in the Office Action, neither Smyers nor Bean teaches that each module include a cache

memory. Office Action, pp. 16, 20. For at least these reasons, Smyers and Bean do not teach or suggest each of the elements and limitations of claims 11 and 15.

Dekoning also fails to remedy the inadequacies of Smyers and Bean. Dekoning is relied upon to show the existence of a cache memory in each module connected to a primary interconnect. Office Action, pp. 16, 20. However, Applicants respectfully disagree that Dekoning shows the existence of a cache memory within each module. Figure 4 of Dekoning, referenced in the Office Action, shows a cache memory in two specific caching controller devices. However, a cache memory is not shown within the multiple data storage element controllers. In fact, the Dekoning invention has no need "for duplicative local cache memory on each of the plurality of storage controllers" because of the existence of one or more central caching controllers. Dekoning, Abstract. In other words, Dekoning does not teach, but instead teaches away from the inclusion of a cache memory in each module of the scalable storage controllers recited by claims 11 and 15.

Furthermore, for the same reasons, Dekoning does not teach that each module includes a processing element configured to "store the host command and report the execution status of the host command to the host after the host command has been executed to completion even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command." In Dekoning, only the caching controller stores the host command, not the data storage element controllers. Additionally, Dekoning fails to remedy the inadequacies of Smyers and Bean relating to the reporting of an execution status, wherein the status indicates that the host command has been executed to completion.

For at least these reasons, the combination of Smyers, Deknoning and Bean fails to render claims 11 and 15 unpatentable. Claims 11 and 15 are allowable. Claims 12-14 depend from claim 11, and are thus allowable for at least the same reasons claim 11 is allowable. Claim 16 depends from claim 15 and is allowable for at least the same reasons that claim 15 is allowable. Applicants respectfully request the rejection be withdrawn and the claims allowed.

Claims 17 and 18 stand rejected under 35 U.S.C. § 103(a) as being obvious over Smyers in view of U.S. Patent No. 6,850,938 to Sadjadi ("Sadjadi") and further in view of Bean. The rejection is respectfully traversed.

Claim 17 relates to a method of conflict detection in "a storage controller comprising a plurality of modules each capable of receiving host commands." The method includes "receiving, at a first module, a first access request, storing the first access request at the first module until the first access request has been completed, receiving, at a second module, a second access request, [and] storing the second access request at the second module until the second access request has been completed." After the received access request is executed to completion by either of the first or second modules, the executing module forwards "an execution status from the module that received the access request to a host that sent the access request, the execution status indicating the completion of the access request." Neither Smyers, Sadjadi nor Bean teach or suggest each of the elements and limitations recited by claim 17.

As explained above, Smyers and Bean fail to teach or suggest a module that receives and stores an access request and also forwards an execution status to the requesting host wherein the execution status indicates completion of the access request and is forwarded after the received access request has been executed to completion. Sadjadi also fails to remedy the inadequacies of Smyers.

Sadjadi teaches a method of conflict detection and resolution, but still does not teach all of the elements and limitations recited in claim 17. Specifically, Sadjadi fails to teach or suggest that a receiving module stores an access request. Additionally, Sadjadi does not teach or suggest the forwarding of an execution status to the requesting host, the execution status indicating completion of the access request. For at least these reasons, Sadjadi fails to render claim 17 unpatentable.

Because neither Smyers, Sadjadi nor Bean, individually or combined, teaches or suggests at least these elements and limitations of claim 17, claim 17 is allowable over the combination of Smyers and Sadjadi. Claim 18, which depends from claim 17, is also allowable for

at least the same reasons claim 17 was allowable. Applicants respectfully request the rejection be withdrawn and the claims be allowed.

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

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Respectfully submitted,

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